6-14 GEOSYNTHETIC RETAINING WALLS

6-14.1 Description

This Work consists of constructing geosynthetic retaining walls, including those shown in the Standard Plans.

6-14.2 Materials

Materials shall meet the requirements of the following sections:

Gravel Borrow For Geosynthetic Retaining Wall	9-03.14(4)
Construction Geosynthetic	9-33

The requirements specified in Section 2-12.2 for geotextile shall also apply to geosynthetic and geogrid materials used for permanent and temporary geosynthetic retaining walls.

Other materials required shall be as specified in the Special Provisions.

6-14.3 Construction Requirements

Temporary geosynthetic retaining walls are defined as those walls and wall components constructed and removed or abandoned before the Physical Completion Date of the project or as shown in the Plans. All other geosynthetic retaining walls shall be considered as permanent.

6-14.3(1) Quality Assurance

The Contractor shall complete the base of the retaining wall excavation to within plus or minus 3-inches of the staked elevations unless otherwise directed by the Engineer. The Contractor shall place the external wall dimensions to within plus or minus 2-inches of that staked on the ground. The Contractor shall space the reinforcement layers vertically and place the overlaps to within plus or minus 1-inch of that shown in the Plans.

The completed wall(s) shall meet the following tolerances:

	Permanent Wall	Temporary Wall
Deviation from the design batter and horizontal alignment for the face when measured along a 10-foot straight edge at the midpoint of each wall layer shall not exceed:	3-inches	5-inches
Deviation from the overall design batter per 10-feet of wall height shall not exceed:	2-inches	3-inches
Maximum outward bulge of the face between backfill reinforcement layers shall not exceed:	4-inches	6-inches

6-14.3(2) Submittals

A minimum of 14 calendar days prior to beginning construction of each wall the Contractor shall submit detailed plans for each wall in accordance with Section 6-01.9. As a minimum, the submittals shall include the following:

1. Detailed wall plans showing the actual lengths proposed for the geosynthetic reinforcing layers and the locations of each geosynthetic product proposed for use in each of the geosynthetic reinforcing layers.

2. The Contractor's proposed wall construction method, including proposed forming systems, types of equipment to be used, proposed erection sequence and details of how the backfill will be retained during each stage of construction.
3. Manufacturer's Certificate of Compliance, samples of the retaining wall geosynthetic and sewn seams for the purpose of acceptance as specified.
4. Details of geosynthetic retaining wall corner construction, including details of the positive connection between the wall sections on both sides of the corner.
5. Details of terminating a top layer of retaining wall geosynthetic and backfill due to a changing retaining wall profile.

Approval of the Contractor's proposed wall construction details and methods shall not relieve the Contractor of their responsibility to construct the walls in accordance with the requirements of these Specifications.

6-14.3(3) Excavation and Foundation Preparation

Excavation shall conform to Section 2-09.3(4), and to the limits and construction stages shown in the Plans. Foundations soils found to be unsuitable shall be removed and replaced in accordance with Section 2-09.3(1)C.

The Contractor shall direct all surface runoff from adjacent areas away from the retaining wall construction site.

6-14.3(4) Erection and Backfill

The Contractor shall begin wall construction at the lowest portion of the excavation and shall place each layer horizontally as shown in the Plans. The Contractor shall complete each layer entirely before beginning the next layer.

Geotextile splices shall consist of a sewn seam or a minimum 1-foot 0-inches overlap. Geogrid splices shall consist of adjacent geogrid strips butted together and fastened using hog rings, or other methods approved by the Engineer, in such a manner to prevent the splices from separating during geogrid installation and backfilling. Splices exposed at the wall face shall prevent loss of backfill material through the face. The splicing material exposed at the wall face shall be as durable and strong as the material to which the splices are tied. The Contractor shall offset geosynthetic splices in one layer from those in the other layers such that the splices shall not line up vertically. Splices parallel to the wall face will not be allowed, as shown in the Plans.

The Contractor shall stretch out the geosynthetic in the direction perpendicular to the wall face to ensure that no slack or wrinkles exist in the geosynthetic prior to backfilling.

For geogrids, the length of the reinforcement required as shown in the Plans shall be defined as the distance between the geosynthetic wrapped face and the last geogrid node at the end of the reinforcement in the wall backfill.

The Contractor shall place fill material on the geosynthetic in lifts such that 6-inches minimum of fill material is between the vehicle or equipment tires or tracks and the geosynthetic at all times. The Contractor shall remove all particles within the backfill material greater than 3-inches in size. Turning of vehicles on the first lift above the geosynthetic will not be permitted. The Contractor shall not end dump fill material directly on the geosynthetic without the prior approval of the Engineer.

Should the geosynthetic be damaged or the splices disturbed, the backfill around the damaged or displaced area shall be removed and the damaged strip of geosynthetic replaced by the Contractor at no expense to the Contracting Agency.

The Contractor shall use a temporary form system to prevent sagging of the geosynthetic facing elements during construction. A typical example of a temporary form system and sequence of wall construction required when using this form are detailed in the Plans. Soil piles or the geosynthetic manufacturer's recommended method, in combination with the forming system shall be used to hold the geosynthetic in place until the specified cover material is placed.

The Contractor shall place and compact the wall backfill in accordance with the wall construction sequence detailed in the Plans and Method C of Section 2-03.3(14)C, except as follows:

1. The maximum lift thickness after compaction shall not exceed 10-inches
2. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density.
3. Rollers shall have sufficient capacity to achieve compaction without causing distortion to the face of the wall in accordance with Section 6-14.3(1).
4. The Contractor shall not use sheepsfoot rollers or rollers with protrusions.
5. The Contractor shall compact the zone within 3-feet of the back of the wall facing panels without causing damage to or distortion of the wall facing elements (welded wire mats, backing mats, construction geotextile for wall facing, precast concrete facing panels, and concrete blocks) by using a plate compactor as approved by the Engineer. No soil density tests will be taken within this area.
6. For wall systems with geosynthetic reinforcement, the minimum compacted backfill lift thickness of the first lift above each geosynthetic reinforcement layer shall be 6-inches.

The Contractor shall construct wall corners at the locations shown in the Plans, and in accordance with the wall corner construction sequence and method submitted by the Contractor and approved by the Engineer. Wall angle points with an interior angle of less than 150-degrees shall be considered to be a wall corner. The wall corner shall provide a positive connection between the sections of the wall on each side of the corner such that the wall backfill material cannot spill out through the corner at any time during the design life of the wall. The Contractor shall construct the wall corner such that the wall sections on both sides of the corner attain the full geosynthetic layer embedment lengths shown in the Plans.

Where required by retaining wall profile grade, the Contractor shall terminate top layers of retaining wall geosynthetic and backfill in accordance with the method submitted by the Contractor and approved by the Engineer. The end of each layer at the top of the wall shall be constructed in a manner that prevents wall backfill material from spilling out the face of the wall throughout the life of the wall. If the profile of the top of the wall changes at a rate of 1:1 or steeper, this change in top of wall profile shall be considered to be a corner.

6-14.3(5) Guardrail Placement

The Contractor shall install guardrail posts as shown in the Plans after completing the wall, but before the permanent facing is installed. The Contractor shall install the posts in a manner that prevents bulging of the wall face and prevents ripping, tearing, or pulling of the geosynthetic reinforcement. Holes through the geosynthetic reinforcement shall be the minimum size necessary for the post. The Contractor shall demonstrate to the Engineer prior to beginning guardrail post installation that the installation method will not rip, tear, or pull the geosynthetic reinforcement.

6-14.3(6) Permanent Facing

The Contractor shall apply a permanent facing to the surface of all permanent geosynthetic retaining walls as shown in the Plans. Shotcrete facing, if shown in the Plans, shall conform to Section 6-18. Concrete fascia panel, if shown in the Plans, shall conform to Section 6-15.3(9).

6-14.3(7) Geosynthetic Retaining Wall Traffic Barrier and Geosynthetic Retaining Wall Pedestrian Barrier

Geosynthetic wall traffic barrier (single slope and f-shape) and geosynthetic retaining wall pedestrian barrier shall be constructed in accordance with Sections 6-02.3(11)A and 6-10.3(2), and the details in the Plans.

6-14.4 Measurement

Permanent geosynthetic retaining wall and temporary geosynthetic retaining wall will be measured by the square foot of face of completed wall. Corner wrap area and extensions of the geosynthetic wall beyond the area of wall face shown in the Plans or staked by the Engineer are considered incidental to the wall construction and will not be included in the measurement of the square foot of face of completed geosynthetic retaining wall.

Gravel borrow for geosynthetic retaining wall backfill will be measured as specified in Section 2-03.4.

Shotcrete facing and concrete fascia panel will be measured by the square foot surface area of the completed facing or fascia panel, measured to the neat lines of the facing or panel as shown in the Plans. When a footing is required, the measurement of the fascia panel area will include the footing.

Geosynthetic wall single slope traffic barrier, geosynthetic wall f-shape traffic barrier, and geosynthetic retaining wall pedestrian barrier will be measured as specified in Section 6-10.4 for cast-in-place concrete barrier.

Structure excavation Class B, Structure excavation Class B including haul, and shoring or extra excavation Class B, will be measured in accordance with Section 2-09.4.

6-14.5 Payment

Payment will be made in accordance with Section 1-04.1 for each of the following Bid items when they are included in the Proposal:

"Geosynthetic Retaining Wall", per square foot.

"Temporary Geosynthetic Retaining Wall", per square foot.

All costs in connection with constructing the temporary or permanent geosynthetic retaining wall as specified shall be included in the unit Contract price per square foot for "Geosynthetic Retaining Wall" and "Temporary Geosynthetic Retaining Wall", including compaction of the backfill material and furnishing and installing the temporary forming system.

"Gravel Borrow for Geosynthetic Ret. Wall Incl. Haul", per ton or per cubic yard.

All costs in connection with furnishing and placing backfill material for temporary or permanent geosynthetic retaining walls as specified shall be included in the unit Contract price per ton or per cubic yard for "Gravel Borrow for Geosynthetic Ret. Wall Incl. Haul".

"Concrete Fascia Panel", per square foot.

All costs in connection with constructing the concrete fascia panels as specified shall be included in the unit Contract price per square foot for "Concrete Fascia Panel", including all steel reinforcing bars, premolded joint filler, polyethylene bond breaker strip, joint sealant, PVC pipe for weep holes, exterior surface finish, and pigmented sealer (when specified).

Shotcrete facing will be paid for in accordance with Section 6-18.5.

"Geosynthetic Wall Single Slope Traffic Barrier", per linear foot.

"Geosynthetic Wall F-Shape Traffic Barrier", per linear foot.

"Geosynthetic Retaining Wall Pedestrian Barrier", per linear foot.

The unit Contract price per linear foot for "Geosynthetic Wall Single Slope Traffic Barrier", "Geosynthetic Wall F-Shape Traffic Barrier", and "Geosynthetic Retaining Wall Pedestrian Barrier" shall be full pay for constructing the barrier on top of the geosynthetic retaining wall.

"Structure Excavation Class B", per cubic yard.

"Structure Excavation Class B Incl. Haul", per cubic yard.

"Shoring Or Extra Excavation Class B", per square foot.